Feed Improvement Task

DOE OBP Thermochemical Platform Review Meeting
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Presentation Outline

biomass program

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- Technical Feasibility and Risks
- Competitive Advantage
- Project Overview
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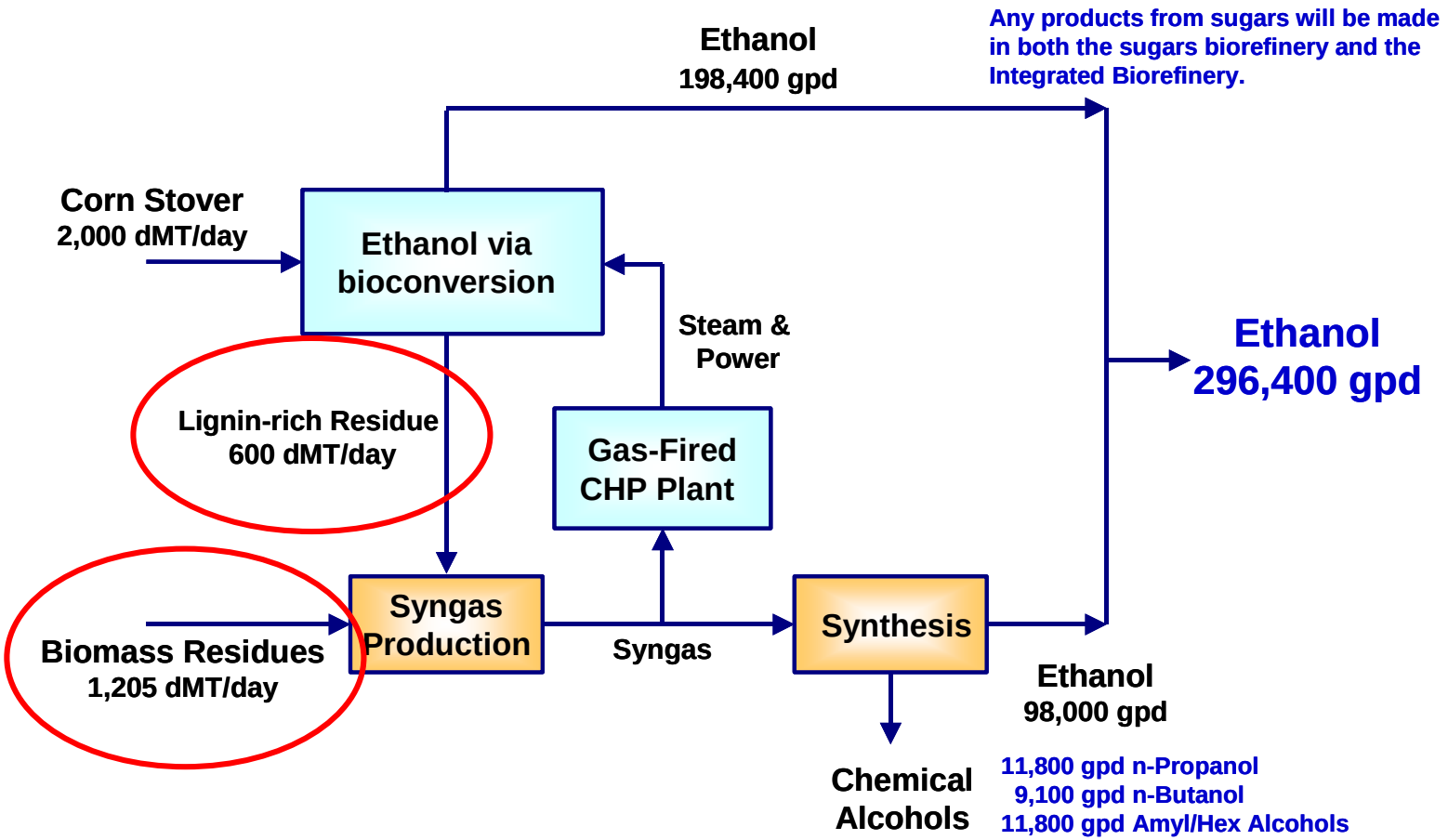
- Plan/Schedule
- Critical Issues and Show-stoppers
- Summary

Project Background

biomass program

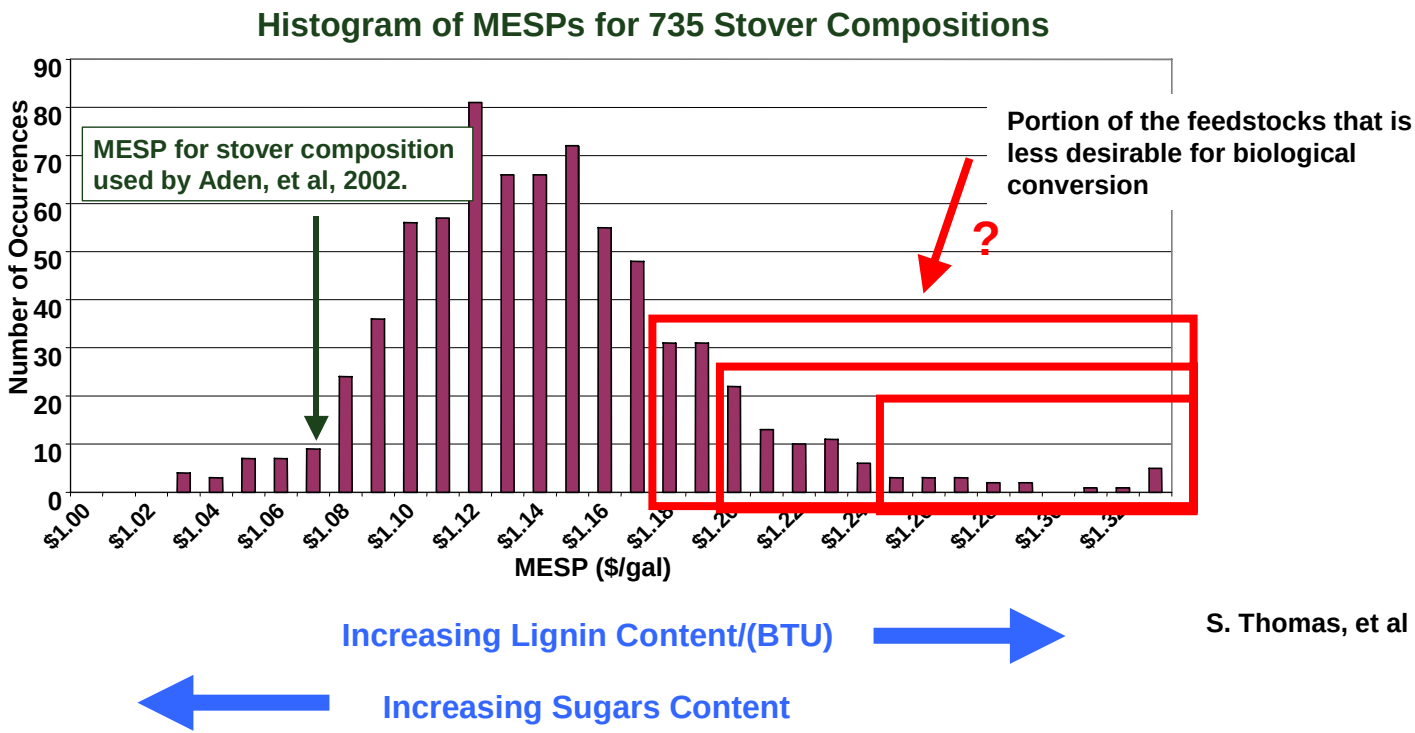
Integration of Biochemical and Thermochemical process will benefit both energy efficiency and economics



Project Background

biomass program

- Variations in the chemical composition (sugars) of corn stover have a significant impact on the price of ethanol
- Handling the lignin-rich fermentation residues coming from NREL's Biochemical PDU will require new equipment.



Project Background

biomass program

Ag Residues | **Perennial Grasses** **Woody Crops** | **Pulp and Paper** | **Forest Products**

Validate Feeder System Performance

Validate Gasification Performance

M 4.11.1	M 4.12.1
M 4.11.2	M 4.12.2
M 5.11.2	M 5.12.2

Project Milestones	Type	Performance Expectations	Due Date
Feed Improvement Task	D	Provide the data on the volumes and properties of the residue streams, and the opportunities for feeding these residue streams in the Integrated Sugars/Thermochemical Biorefinery.	Aug. 2005

Technical Feasibility and Risks

- Gasification technology developed for coal and natural gas to fuels or chemicals, developing for biomass for fuel gas and black liquor,
- Economics/integration are the questions for biomass

- Little technical risk in getting feedstocks, but some uncertainty in getting representative materials
- There are significant differences in the design and operation of different biorefineries (dry mills and pulp and paper mills) and it is difficult to know what is “representative”

Competitive Advantage

- Thermochemical technologies are required conversion of lignin-rich residues and off-spec/low-cost biomass to fuels
- Expect that variations in feedstock quality will have minimal impact on TC processes (feed MC key)
- Can utilize low cost “opportunity” biomass feedstocks, e.g., linear programming models for petroleum refineries or wood residues into pulp and paper mills

Project Overview

Direct response to the request to refocus the TC Platform to align with the Integrated Biorefinery

Joint NREL/PNNL project

- Provide corn stover and lignin-rich residues as feedstock for the TC PDU gasification runs
- Determine the hardware needed to utilize lignin-rich fermentation residues from NREL's Biochemical PDU
- Determine variations in the composition and physical properties of corn stover and biorefinery residues

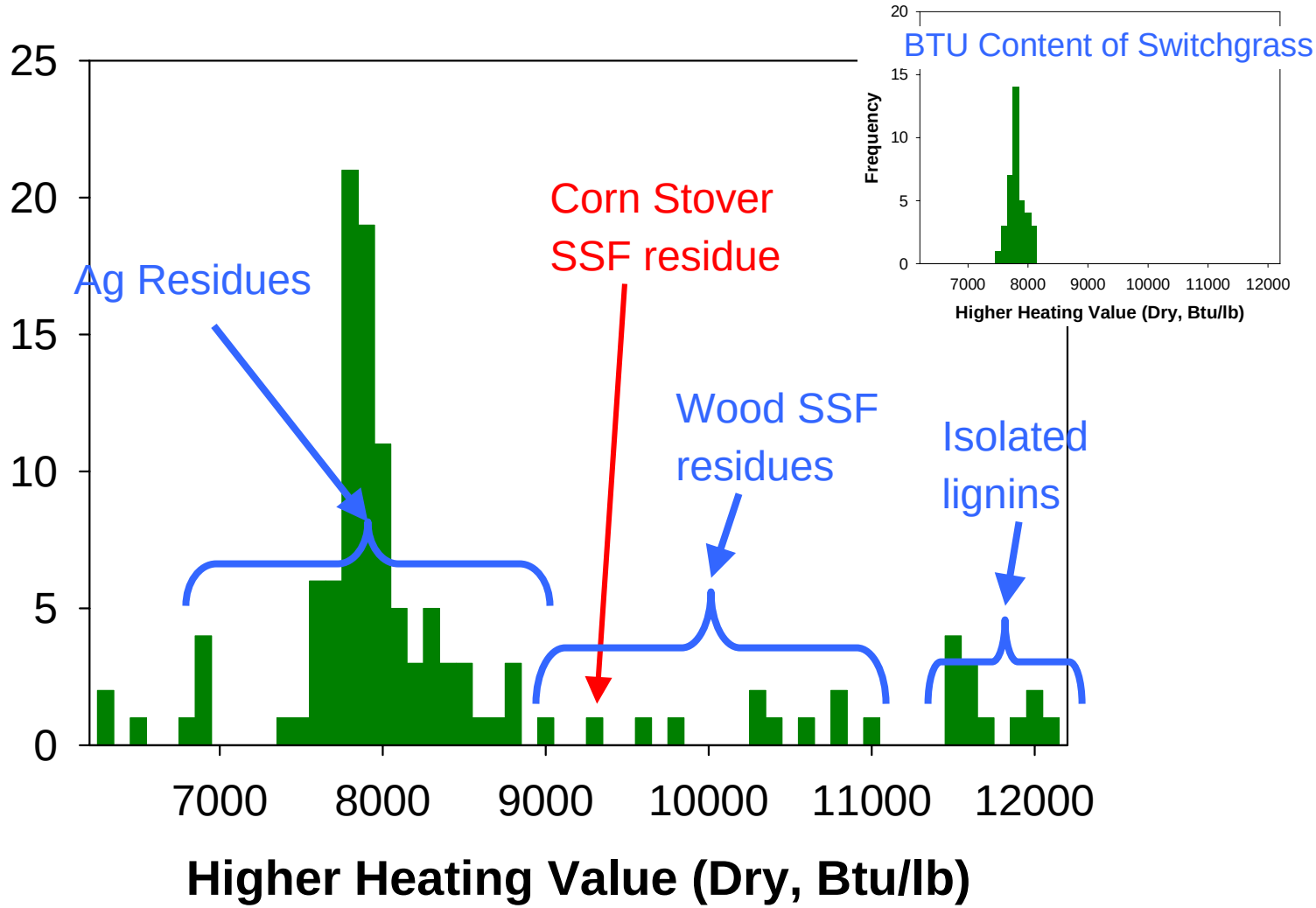
History and Accomplishments

- NREL (Thomas) and INL (Hess) worked to produce 7 tons of corn stover pellets for TC PDU gasification runs
- Two tons of wheat straw pellets were also provided by INL
- Have begun characterization of corn stover variability as it may impact TC processes (Btu, ash, S, Cl)
- Have begun work to characterize volume and composition of residue streams from biorefineries

History and Accomplishments

biomass program

BTU Content of Biomass Materials

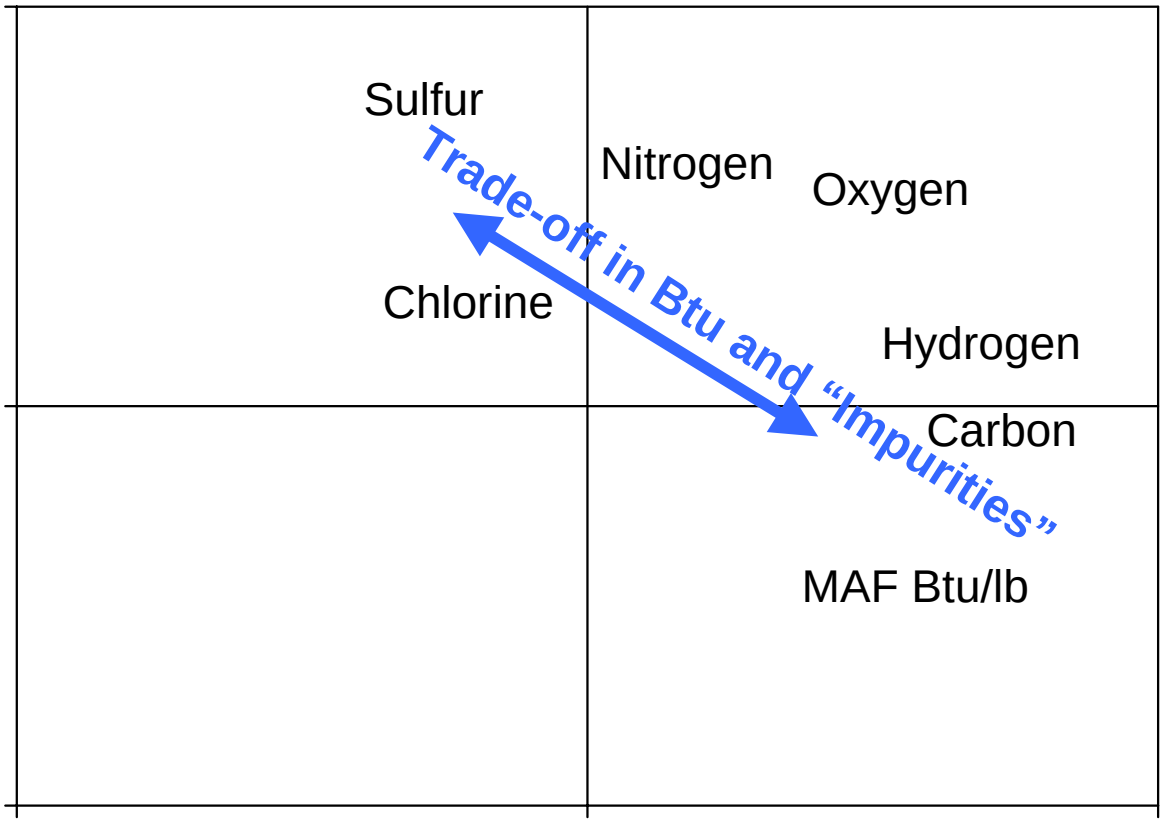


History and Accomplishments

biomass program

Inverse Relationship Between Sulfur/Chlorine and Btu Content of Corn Stover

(14 samples)



Plan/Schedule

- On schedule to complete analysis of corn stover and biorefinery residues
- On schedule to define equipment needs for handling fermentation residues, e.g., pumping drying, compaction, etc.
- On schedule to complete survey (volume and quality) of biorefinery process streams
- FY 06 plans include production of at least 500 pounds of lignin-rich residues from corn stover at NREL

Critical Issues/Show-stoppers

- Need to produce enough lignin-rich residues to complete TC PDU gasification runs

- No potential show-stoppers

Summary

biomass program

- The BTU content of CS is relatively narrow and independent of source
- BTU content of lignin-rich residues will be heavily dependent on conversion process and moisture content
- Inverse relationship between BTU content and sulfur/chlorine
- Relative benefits of drying lignin-rich residues for high temperature gasification or direct (wet) gasification is being evaluated

- FY05 budget $400k

Acknowledgements

Dave Dayton

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